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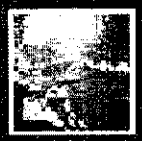

Natural Resource Damages Associated with Aesthetic and Ecosystem Injuries to Oklahoma's Illinois River System and Tenkiller Lake

Expert Report for State of Oklahoma, in Case No. 05-CV-0329-GKF-SAJ, State of Oklahoma v. Tyson Foods, et al. (In the United States District Court for the Northern District of Oklahoma)

Volume I

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1.3 Charge to the Team

1.3.1 Overview of the charge

The State of Oklahoma has filed suit in federal court asking for, among other things, an injunction to stop all spreading of poultry waste on lands in the Illinois River watershed in both Oklahoma and Arkansas. Unfortunately, this injunction alone will not resolve the problems caused by excess phosphorus loading for many years. Large quantities of phosphorus from past spreading will remain in the soils in the area and will continue to wash into the Illinois River system (i.e., the Illinois River, its tributaries, and Tenkiller Lake) for the next 50 years and beyond.

The Team was commissioned to investigate natural resource damages in Oklahoma associated with the runoff and leachate of poultry waste into the Illinois River system and Tenkiller Lake, based on the state's injury studies, particularly Fisher (2008), Engel (2008a, 2008b, 2008c), Wells et al. (2008a, 2008b), Stevenson (2008a, 2008b, 2008c), and Cooke and Welch (2008a, 2008b). The Team was asked to conduct the investigation within the overall framework of a natural resource damage assessment (NRDA).

1.3.2 Approach to natural resource damages

For purposes of this report, "injuries" were defined as the deleterious chemical, physical and biological effects of excess phosphorus on water quality in the Illinois River system, including Tenkiller Lake. "Services" were the physical and biological functions performed by the natural resources and included the functions provided to humans. The overall level and quality of services that Oklahomans receive from the Illinois River system and Tenkiller Lake are linked to the quality of those resources. Injuries to natural resources result in lost services. "Natural resource damages" are the monetary value placed on the changes in services resulting from injuries to Oklahoma trust resources of the Illinois River system and Tenkiller Lake.

In conducting the analysis of damages reported here, the Team focused exclusively on damages from future injuries resulting from past and current land applications of poultry waste. Furthermore, the Team considered only the aesthetic and ecosystem effects resulting from excess phosphorus. Negative aesthetic effects included algae-related reductions in water clarity and the presence of more algae on the bottom and along the edges of the river and lake than would otherwise have occurred. The presence of excess algae has affected, and will continue to affect, the fish and other elements of the ecosystem of the river and lake. These effects of algae on the ecosystem will be discussed in more detail in Chapters 3 and 4. Table 1.1 lists the categories of damages estimated in this damage assessment report and indicates which categories were not included.

Table 1.1. Categories of damages included and not included in this study

Damage category	
Included	**Not included**
Damages for future aesthetics	Past damages
Damages for future ecosystem effects	Damages for groundwater injuries
	Damages for drinking water injuries
	Damages for human health effects
	Punitive damages

Past damages from aesthetic and ecosystem effects of algae are addressed in a separate report (Hanemann et al., 2009). Injuries to surface drinking water and groundwater were not addressed in this report or in the separate assessment of past damages.

1.3.3 The total valuation framework for damage assessment

This study was planned and executed using what is known as the *total valuation framework* (Freeman, 2003). Total values may include both use and nonuse values. As used in this study, *use values* are those values that are affected when members of the public personally use injured resources or would have used them in an uninjured state. For example, if excess algae in Tenkiller Lake reduces the aesthetics of the lake, or reduces catch of favored fish in the lake, enjoyment of the lake by anglers may decline, which would reduce the angler's use and/or enjoyment of the lake. *Nonuse values*[2] are values that people place on natural resources for reasons other than their personal use. For example, people may value natural resources of the Illinois River system and Tenkiller Lake in an uninjured state (e.g., without compromised aesthetics or ecosystem) because they want to bequeath them to future generations. This component of nonuse value is referred to as "bequest value." Or, they may place a value on simply knowing that a resource exists in an uninjured state, or for other reasons. This is referred to as "existence value." Nonuse values are also sometimes referred to as "passive use values."

Total value measures of natural resource damages are consistent with both economic theory and the definition of natural resource damages in the U.S. Department of the Interior (DOI) NRDA regulations at 43 C.F.R. 11.83 (C) (1):

2. For recent theoretical treatises on the topic, see Flores (2003) and Freeman (2003). Or see Anderson (2006), Field and Field (2006), Goodstein (2005), Hanley et al. (2006), and Tietenberg (2006).